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REMARKS

Inappropriateness of most recent office action being final

Applicant contends that the office action of January 13, 2005, was improperly made final by the Examiner. In particular, in paragraph 5, on page 5, of this office action, the Examiner indicates that "Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action." However, Applicant made no such amendment. The previous office action response, on December 17, 2004, did not amend the claims at all.

Applicant therefore submits that the finality of the present office action is improper, and requests that it be turned into a non-final office action.

Claim rejections under 35 USC 103(a)

Claims 1-9 have been rejected under 35 USC 103(a) as being unpatentable over Luick (6,088,769) in view of Hoover (6,006,255). All of the pending claims are limited to an interconnect being "a sole repository of cache coherence information" within a multiprocessor system. Applicant strongly contends that Luick is not properly combinable with Hoover to render the claimed invention *prima facie* obvious in this respect, and strongly asserts that the Examiner's position would not be sustained on appeal. Applicant provides three separate reasons as to why Luick is not properly combined with Hoover to render the claimed invention *prima facie* obvious.

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I: Modifying Luick renders Luick unsatisfactory for its intended purpose

A proposed modification to a reference “cannot render the prior art unsatisfactory for its intended purpose.” (MPEP 2143.01) “If the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification.” (Id., citations omitted)

In the present invention, the Examiner indicates that Luick does not teach an interconnect being a sole repository of cache coherence information, as to which the claimed invention is limited, but that Hoover is combinable in this respect with Luick to render the claimed invention *prima facie* obvious. However, modifying Luick so that the interconnect is a sole repository of cache coherence information renders Luick unsatisfactory for its intended purpose.

Luick indicates that “[o]ne way to ensure that coherence is maintained is to maintain a directory (or table) which points to each non-local cache in which . . . data resides.” (Col. 1, ll. 59-61) But Luick indicates that there are problems associated with using just a single repository of cache coherence information, such as a single table. “[M]aintaining one table which points to each copy within each node increases the complexity and width of directory entries within such tables, making the table relatively large and complex.” (Col. 1, l. 66, through col. 2, l. 2) To solve this problem, Luick teaches the use of *more than one* repository of cache coherence information – local coherence tables and a global coherence table. “The use of local coherence tables and a global coherence table reduces the size and complexity of the coherence table that would otherwise be required.” (Col. 3, ll. 7-9) In this way, Luick achieves its stated “object . . . to provide a system and method for maintaining coherence . . . by storing small and simple entries in coherence tables.” (Col. 2, ll. 3-7) Luick indeed indicates that its multiple-repository approach for storing cache coherence information also provides it with other advantages. “Still further, by maintaining a local coherence table to indicate when shared data is current, use of the logical interconnect is reduced.” (Col. 3, ll. 11-13)

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Modifying Luick so that the interconnect is a sole repository of cache coherence information, as in the claimed invention, thus renders Luick unsatisfactory for its intended purpose. The intended purpose of Luick is to use more than one repository of cache coherence information, both local coherence tables and a global coherence table. This is because using only a single repository of cache coherence information, such as a global coherence table, is considered problematic in Luick, in that the table has to be relatively large and complex. The intended purpose of Luick is to store "small and simple entries" in *multiple* coherence tables. Furthermore, having local coherence tables in addition to a global coherence table reduces use of the global interconnect, another intended purpose of Luick.

Quite simply, modifying Luick so that there is a single and sole repository of cache coherence information is antithetical to all of the stated goals of Luick. Luick discusses the disadvantages of having a sole repository of cache coherence information, because such a single repository has complex table entries. Its purpose is to have simple table entries by virtue of having more than one repository of cache coherence information. Modifying Luick so that it instead just has a sole repository of cache coherence information goes against all intended purposes of Luick, such that Luick is not properly modified to render the claimed invention *prima facie* obvious.

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2: Luick was not considered in its entirety, including disclosures that teach away from invention

The “prior art must be considered in its entirety, including disclosures that teach away from the claims.” (MPEP 2141.02) “A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention.” (MPEP 2141.02)

In the present invention, the Examiner provides reasoning as to why Hoover should be combined with Luick that ignores the explicit teachings of Luick. However, it is highly dubious that one of ordinary skill within the art, in reviewing Luick, would modify Luick to have a single and sole repository of cache coherence information, when nearly *everything* that is stated in Luick argues for the opposite conclusion, of having more than one repository of cache coherence information. That is, the Examiner has not considered Luick as a whole in combining Hoover with Luick.

First, the title of Luick is “multiprocessor cache coherence directed by *combined local and global tables*.¹” Therefore, one of ordinary skill in just picking up Luick for the first time would come to the conclusion that Luick argues for more than one repository of cache coherence information, in both local and global tables.

Furthermore, in reading the description of the related art in columns 1 and 2 of Luick, one of ordinary skill within the art would come to the conclusion that a sole repository of cache coherence information is undesirable. In particular,

One way to ensure that coherence is maintained is to maintain a directory (or table) which points to each non-local cache in which the data resides. . . . However, maintaining one table which points to each copy within each node increases the complexity and width of directory entries within such tables, making the tables relatively large and complex.

Accordingly, it is an object of the present invention to provide a system and method for maintaining coherence of data stored in multiple caches within a multiprocessor system by storing relatively small and simple entries in [multiple] coherence tables.

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(Col. 1, l. 59, through col. 2, l. 7) In reading this explicit disclosure of Luick, it is difficult to surmise that one of ordinary skill within the art would be led to use a single repository of cache coherence information, as Luick explicit teaches away from the use of a single repository.

Thus, reading Luick as a whole leads away from the claimed invention – Luick explicitly says that a single repository of cache coherence information is undesirable. Luick as a whole *away from* the claimed invention: Luick as a whole provides a suggestion or motivation *not* to combine Hoover with Luick. Luick is not properly combined with Hoover to render the claimed invention *prima facie* obvious.

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3: Modifying Luick in view of Hoover changes its principle of operation

A “proposed modification cannot change the principle of operation of a reference.” (MPEP 2143.01) “If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious.” (Id.)

In the present invention, the Examiner is modifying Luick to recite a single repository of cache coherence information, per the teachings of Hoover. Applicant strongly contends and submits, however, that so modifying Luick very much changes the principle of operation of Luick. Therefore, such modification to Luick is not properly performed, and the claimed invention, which is limited to a single repository of cache coherence information, is not rendered *prima facie* obvious.

Every aspect of Luick is directed to having more than one repository of cache coherence information. The title of Luick is “multiprocessor cache coherence directed by combined local and global tables.” The abstract of Luick indicates that there are both a “local coherence unit” and a “global coherence unit” to store cache coherence information. As has been described above, the description of the related art in Luick describes why a single repository of cache coherence information is undesirable. As also has been described above, Luick describes why having more than a single repository of cache coherence information is desirable.

Furthermore, in reading the detailed description of Luick, one finds that every aspect of every embodiment of Luick is directed towards having more than one repository of cache coherence information. FIG. 1 is shown and described as including a local cache coherence table 121 in each node, as well as a global cache coherence table 129 in the interconnect. FIGs. 2A-2C show the organization of entries within each of the *multiple* local cache coherence tables. FIGs. 3, 4 and 5 show methods in which a local cache table (step 303) and a global cache table (step 315) can both be examined for cache coherence information. FIGs. 6 and 7 show methods in which both local cache tables and the global cache table are updated (step 613 in FIG. 6, steps

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703 and 705 in FIG. 7). All of the figures of Luick thus pertain to and are described as having *multiple* repositories of cache coherence information.

Therefore, quite simply, the entire *raison d'être* (i.e., the entire reason for being) of Luick is having both a global coherence table and a number of local coherence tables to maintain cache coherence information. Modifying Luick so that there is only a single repository of cache coherence information not only merely changes its principle of operation, such modification utterly destroys the principle of operation of Luick. Luick is simply not properly combined with Hoover to render the claimed invention *prima facie* obvious. Applicant strongly contends that the Examiner's position would not be supported on appeal.

Conclusion

Applicants have made a diligent effort to place the pending claims in condition for allowance, and request that they so be allowed. However, should there remain unresolved issues that require adverse action, it is respectfully requested that the Examiner telephone Applicants' Attorney so that such issues may be resolved as expeditiously as possible. For these reasons, this application is now considered to be in condition for allowance and such action is earnestly solicited.

Respectfully Submitted,



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